

**MASHANTUCKET PEQUOT
UTILITIES DEPARTMENT**

**WATER MAIN SPECIFICATIONS
AND REQUIREMENTS**

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GENERAL CONDITIONS

1. Water service and house sewer pipes shall be laid in separate trenches at least ten feet apart. When approved to be laid in the same trench due to warranted conditions, the water pipe shall be laid on a bench at least 18" above the top of the sewer pipe and 18" from the side of the sewer pipe.
2. Water main and services shall maintain a minimum of 10 ft distance from a sewer force main. Should it not be possible to maintain the 10 ft separation distance, upon approval from MPTN Utilities Dept, the force main will need to be encased in concrete in lieu of required separation distance. All water main bell joints located within the required 10 ft separation distance shall have bell repair couplings installed to provide an additional gasket at joints.
3. Minimum cover on water mains and services shall be 4'-6".
4. In general, separate utilities (each separate residential unit in a condominium) shall be separately metered and have separate water services.
5. Water mains should be at least 10' from any building.
6. Curb boxes should be at least 6' from any building.
7. Minimum size of any main line water main to supply a hydrant – 8".
8. Hydrant branch line size – 6" minimum.
9. Minimum size of any water service installed from the main to property line shall be 1-1/2".
10. Meters:

Exterior Meters located in meter pits shall be so located as to be accessible to the main distribution line for proper service connection. The meter pit shall be installed as to be unaffected by climatic conditions, reasonably secure from damage and in areas not subject to vehicle traffic if possible.

Interior Meters installed inside buildings shall be located as near as possible to the point where the service pipe enters the building and so as to be reasonably secure from damage and readily accessible for reading.

11. Water Mains:

In so far as practicable shall be designed to avoid dead ends. Where dead ends are necessary, hydrants or blow-offs for the purpose of flushing mains must be installed.

12. Remote Water Meter reading devices are required on all units.

13. Backflow Prevention Devices are required on all commercial service and for other potentially contaminating situations.
14. No backfilling of pipe shall be done until an inspection has been made by a designated representative of the Owner or MPTN Department of Utilities, and installation has been approved

TECHNICAL SPECIFICATIONS

EARTH, EXCAVATION, BACKFILL AND FILL

1. SEPARATION OF SURFACE MATERIALS

The contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the work.

2. WIDTH OF TRENCH

Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.

Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation 1 foot above the top of the pipe.

3. TRENCH EXCAVATION

Where pipe is to be laid in gravel bedding, the trench may be excavated by machinery to, or just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed.

4. UNAUTHORIZED EXCAVATION

If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled with thoroughly compacted, screened gravel, if the excavation was for a pipeline, or with concrete, if the excavation was for a masonry structure.

5. EXCAVATION NEAR EXISTING STRUCTURES

Attention is directed to the fact that there are pipes, drains, and other utilities in certain location. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools. Such manual excavation when incidental to normal excavation shall be included in the work to be done under items involving normal excavation.

Where determination of the exact location of pipe or other underground structures is necessary for doing the work properly, the Contractor may be required to excavate test pits to determine such locations.

6. ELIMINATION OF UNSUITABLE MATERIAL

If material unsuitable for foundation is found at or below the grade to which excavation would normally be carried, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel or concrete as directed.

7. SHEETING AND SHORING

The Contractor shall be responsible for supporting and maintaining excavations required hereunder, even to the extent of sheeting or shoring the sides and ends of excavations with the timber or steel sheet piling. The requirements of sheeting or shoring or the addition of supports shall not relieve the Contractor of his responsibility for their sufficiency.

All timbering shall be removed except that for the purpose of preventing injury to the piping or other structures, to other property or persons.

8. REMOVAL OF WATER

Until final acceptance of the work, the Contractor shall pump out or otherwise remove and dispose of as fast as it may collect, any water, sewage or any other liquids which may be found or may accumulate in the excavations, regardless of whether it be water or liquid wastes from his own contract or from any existing conduits, works, or surface runoff.

There shall be upon the work at all times during the construction proper and approved machinery of sufficient capacity (including spare units kept ready for immediate use in case of breakdowns) to meet the maximum requirements for the removal of the water or other liquids and their disposal in such a manner as not to withdraw sand or cement from the concrete and so as not to interfere with the proper laying of pipe and/or masonry or the prosecution of work under this or other contract nor endanger existing structures.

9. PROTECTION TO EXISTING STRUCTURES, VEGETATION

All existing walks, pipes, conduits, poles, wires, fences, stairways, curbing, property line markers, walls, buildings and other structures which do not require to be changed in location, shall be carefully supported and protected from injury by the Contractor and, in case of injury, they shall be restored by him without compensation thereof, to as good condition as that in which they were found.

10. BACKFILLING PIPE TRENCHES

As soon as practicable after the pipes have been laid or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, the backfilling shall be started and thereafter it shall proceed until completion.

- a. Zone Around Pipe: The space between the pipe and bottom side of the trench shall be packed full by hand shovel with sand. In placing the material, care shall be taken that stones do not strike the pipe. The backfill under the pipe shall be thoroughly compacted using curved tamping bars. Sand backfill at the sides and up to the top of the pipe shall be compacted using approved hand tampers. Sand backfill up to a level of 1 foot above the top of the pipe shall be placed in 6-inch layers, leveled along the length and width of the

trench, and thoroughly compacted using approved tampers. No sand shall be placed above the top of the pipe until sand under and at the sides of the pipe has been compacted. Care shall be taken in the use of mechanical or other tampers not to injure or move the pipe or cause the pipe to be supported unevenly.

- b. Materials: The nature of the materials will govern both their acceptability for backfill and the methods best suited for their placement and compaction in the backfill. In general, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of making the construction excavations.

No stone or rock fragment larger than 12 inches in greatest dimension shall be placed in the backfill nor shall large masses of backfill material be dropped into the trench in such a manner as to endanger the pipeline. If necessary, a timber grillage shall be used to break the fall of material dropped from a height of more than 5 feet. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted, in which case they shall be broken up as directed.

- c. Remainder of Trench: The remainder of the trench above the zone around the pipe shall be compacted by tamping, as directed or approved in accordance with the nature of the material.

- d. Tamping: Compaction shall be accomplished by tamping or, under appropriate circumstances, rolling. The material shall be deposited and spread in uniform, parallel layers not exceeding 8 inches thick before compaction. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. If necessary, the Contractor shall furnish and use an adequate number of power driven tampers, each weighing at least 20 lbs., for this purpose. Care shall be taken that the material close to the bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

If necessary to ensure proper compaction by tamping (or rolling), the material shall first be wet by sprinkling. However, no compaction by tamping (or rolling) shall be done when the material is too wet either from rain or too great an application of water to be compacted properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compaction.

- e. Miscellaneous Requirements: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. Only approved quantities of stones and rock fragments shall be used in the backfill. The Contractor shall, as part of the work done under the items involving earth excavation and rock excavation as appropriate, furnish and place all other necessary backfill material.

2. FILL AND BACKFILL UNDER STRUCTURES AND STATE HIGHWAYS

All fill and backfill under structures and pavements adjacent to structures shall be compacted bank-run gravel containing not more than 5 percent material passing a 200 sieve. The entire backfill shall be compacted to 95 percent of maximum density at optimum moisture as determined by Method D of A.S.T.M. D1557-78 Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.54kg) Rammer and 18-inch (457) Drop.

3. DISPOSAL OF MATERIALS

Any excavated materials not required or not suitable for backfilling shall be removed from the site of the work and disposed of by the Contractor at his own expense.

ROCK EXCAVATION

1. WORK INCLUDED

The Contractor shall excavate within the lines and grades as shown or required and shall satisfactorily dispose of any rock, boulders, or existing concrete, stone or masonry which may be encountered in the work.

The word "rock" shall mean boulders and pieces of masonry or concrete exceeding one cubic yard in volume, or solid ledge rock which, in the opinion of the Engineer, requires for its removal, drilling and blasting or wedging, or sledging, or barring, or breaking up with a power operated tool. No soft or disintegrated rock which can be removed with a hand pick or power operated excavator or shovel; no loose, shaken or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock, exterior to the minimum limits allowed, which may fall into the excavation will be measured or allowed.

2. BLASTING AND EXPLOSIVES

Where blasting is necessary, it shall be done in accordance with all ordinances and other pertinent regulations relative to the storing and handling of explosives and the firing of blasts. Such ordinances, regulations and orders shall not, however, relieve the Contractor of any responsibility for damages caused by him or his employees.

SAND AND GRAVEL

4. SAND

- a. Sand shall be the fine granular material naturally produced by the disintegration of rock and shall be sufficiently free of organic material, mica, loam, clay and other deleterious substances. In no case shall sand containing lumps of frozen materials be used.
- b. Gradation of Sand: In case visual inspection of the sand indicates that it is too coarse, the following gradation shall determine its acceptability:

Sieve Size	Percentage Passing Sieves
3/8"	100
#4	95-100
#8	65-90
#16	45-75
#30	30-50
#50	10-22
#100	2-8
#200	3

5. BANK-RUN GRAVEL

- a. General: The Contractor shall furnish, place, and compact bank-run gravel as indicated on the drawings or directed and as herein specified.
- b. Gravel: Bank-run gravel shall be granular material well graded from fine to coarse with a maximum size of 3 inches obtained from approved natural deposits and unprocessed except for the removal of unacceptable materials and stones larger than the maximum size permitted. It shall not contain vegetation, masses of roots, or individual roots more than 18 inches long or more than 1/2 inch in diameter. It shall be substantially free from loam and other organic matter, clay, and other fine or harmful substances.

- c. Placing and Compacting: The bank-run gravel shall be spread in layers of uniform thickness not exceeding 8 inches before compaction and moistened or allowed to dry as directed. Then it shall be thoroughly compacted by means of suitable power-driven tampers or other power-driven equipment.

CONCRETE

1. WORK INCLUDED

The Contractor shall furnish all labor, materials, tools and equipment necessary to construct the concrete work. This will include thrust blocks at pipe bends and tees in trenches, and for all miscellaneous concrete work ordered in the field to meet field conditions.

2. MATERIALS

- a. All materials are to be carefully selected so as to be free of deleterious amounts of acid, alkali and organic material. If these materials are stored at the job, they shall be placed where no foreign materials will be introduced and no deterioration of the cement will take place. Latest revisions of A.S.T.M. Specifications are to be followed.
- b. Portland Cement shall conform to A.S.T.M. C150-85a.
- c. Aggregate shall conform to A.S.T.M. C33-86.
- d. Reinforcing bars shall conform to A.S.T.M. A615-85 or A.S.T.M. A617-84, Grade 40.

3. CONCRETE QUALITY

Concrete shall have a minimum ultimate 28 days compressive strength of 3000 lbs. per square inch using a maximum water content of 6 gallons per bag of cement. The aggregate shall be proportioned to give a dense concrete of this required strength using a maximum aggregate size of $\frac{3}{4}$ inches.

Concrete for pavement replacement shall conform to the requirements of the State of Connecticut, Department of Transportation.

4. MIXING AND PLACING

- a. Concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged.
- b. For job-mixed concrete, the mixer shall be rotated at a speed recommended by the manufacturer, and mixing shall be continued for at least one minute after all material are in the mixer.
- c. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in the standard specifications for Ready-Mixed Concrete A.S.T.M. C94-86a.

- d. Provisions shall be made for maintaining concrete in a moist condition for at least 5 days after placement. Concrete shall be protected against wash by ground water in ditches.
- e. Adequate equipment shall be provided for protecting the concrete from freezing. No frozen material or materials containing ice shall be used. No dependence shall be placed on salt or other chemicals for the prevention of freezing.
- f. Admixtures shall be in conformance with the recommendations and requirements of Form 816 and shall be approved by the Engineer prior to use.

DUCTILE IRON PIPE AND FITTINGS

1.00 QUALITY CONTROL.

- A. Manufacturers' Recommendations: The Contractor shall submit for approval, six (6) copies of the manufacturer's printed recommendations for the storage, protection, handling and installation of the ductile iron pipe, pipe fittings and appurtenances, which shall be strictly adhered to by the Contractor.
- C. Certificate of Compliance: Each shipment of pipe, pipefittings, and appurtenances, shall be accompanied by the manufacturer's notarized certificate certifying conformance with all requirements of these specifications.

2.00 PART 2 - PRODUCTS

GENERAL

- A. All materials to be incorporated into the work shall be new, purchased specifically for this contract. All material shall be made in the United States of America.

DUCTILE IRON PIPE.

- A. Ductile iron pipe shall be Class 52, and shall conform to AWWA specifications C150 and C151, latest revision. Ductile iron pipe shall have push-on type joints with the exception that mechanical joints shall be used at all fitting and along straight pipe sections where mechanical joint restraint is required. All pipe shall have a double bituminous seal coating on all exterior surfaces. Pipe shall be manufactured in USA by Atlantic States Cast Iron Pipe Co., or approved equal.

FITTINGS.

- A. Fittings and plugs for use with the ductile iron pipe specified shall be ductile iron, with a working pressure rating of not less than 250 psi, class 350 conforming to AWWA C153, latest revision, and shall have mechanical joints. Fittings shall be manufactured by Union, Tyler Mechanical Joint, or approved equal.

TRANSITION COUPLINGS

- A. The center sleeve and end rings of couplings shall be made of ductile iron, meeting or exceeding ASTM A536. The coupling shall accommodate the entire O.D. range in the specified size by use of interchangeable color-coded end rings and gaskets.
- B. The coupling shall be made of virgin rubber compound for water use. The SBR shall meet or exceed ASTM D2000-3-BA715. The gasket shall have raised lettering and sizing and state the proper color code for the appropriate end ring.
- C. The coupling shall be equipped with stainless steel bolts, washers, and nuts, and conform to the latest edition of AWWA C111.
- D. Transition/Repair couplings shall be as manufactured by Ford Model FC2A-SH, Smith Blair Model 441, Romac Model 501, Cascade Waterworks Model CTC, or approved equal.
- E. Repair Clamp shall be as manufactured by Smith Blair Model 226 or 227, Dresser Model 360 or approved equal.
- F. Straight connections between two ductile iron pipe sections shall be made by ductile iron solid sleeves with Mega lug restraints.

JOINTS.

- A. Push-on and mechanical type joints for pipe as specified above shall conform to AWWA C111, latest revision. Gasket material for all jointing requirements shall be styrene butadiene (SBR).
- B. Expansion Joints shall be flexible joint single ball or double ball type and shall be manufactured by EBAA Iron.

CEMENT MORTAR LINING.

- A. Interior pipe and fitting surfaces shall be covered with a double cement-mortar continuous lining not less than 1/16" thick, of materials, and applied in accordance with AWWA/ANSI C104/A21.4, latest revision.

STORAGE OF MATERIALS.

- A. Pipe and related materials shall be stored in locations and in a manner approved by the Owner Representative. The locations and manner of storage shall be as to minimize handling of the materials.
- B. The Contractor shall, at all times, be solely responsible for the safe storage of all materials.

TESTING.

A. Manufacturer Testing:

1. Testing of ductile iron pipe shall be done in accordance with AWWA C151, latest revision.
2. Testing of ductile iron fittings shall be done in accordance with AWWA C153, latest revision.
3. Testing of jointing material shall be done in accordance with AWWA C111, latest revision.
4. Testing of the interior coating shall be done in accordance with AWWA C104, latest revision.
5. Certified test reports shall be submitted by the Pipe manufacturer.
6. The Owner Representative shall be notified at least ten (10) days in advance of the date and location of the testing in order to witness the tests.
7. The Contractor shall furnish to the Owner Representative notarized test reports by an independent testing laboratory, which show compliance of all materials furnished to the requirements specified herein. The test reports shall indicate results and methods employed.

JOINT RESTRAINT.

- A. Restraining devices shall be used where indicated, directed or as required. Joint restraint shall be concrete thrust block and mechanical restraint joints. Mechanical joint restraint shall be manufactured by EBAA Iron, of type Mega-Lug pattern, Model 1100 for mechanical joints.
- B. Restraining devices shall be utilized on all mains under the following conditions:
 1. Pipeline direction changes (tees, bends)
 2. Dead end lines (caps, plugs, valves)
 3. Transition pieces (reducers)
- C. Thrust restraint shall be provided via restrained joint, ductile iron pipe meeting AWWA C151/A21.512 and AWWA C111/A21.11. Restrained joint pipe lengths (restrained length) shall be sufficient to restrain thrust imparted by 1½ times the anticipated working pressure but not less than 200 psi.

- D. Thrust restraint utilizing tie-rods shall be utilized on vertical bends from MJ Bend to MJ Bend or as directed by the Owner or specifically indicated. Tie-rod diameters shall be 2 times the diameter required to restrain the main. All rods shall be protected from corrosion with two coats of bituminous paint or epoxy.

PART 3 - EXECUTION

PIPE INSTALLATION.

A. General:

1. All pipe shall be installed in accordance with AWWA C600, latest revision and manufacturer requirements.
 2. All pipe and accessories shall be carefully inspected by the Contractor for defects before installation and all defective unsound or damaged materials shall be rejected.
 3. The Owner Representative will make such additional inspections as he deems necessary and the Contractor shall furnish all necessary assistance for such inspection.
 4. Proper implements, tools, and facilities satisfactory to the Owner Representative shall be provided by the Contractor for the proper and satisfactory execution of the work.
- B. Pipe, accessories, and appurtenances shall be new and unused, and shall be of the types and materials specified, as indicated or as directed.
- C. The interior of pipe and fittings shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations.
- D. Pipelines shall be constructed in dry trenches and shall not be laid when the conditions of the trench or the weather is unsuitable for such work.
- E. The trench bottom and gravel bedding shall be shaped and compacted to give substantially uniform unyielding circumferential support to the lower fourth of the full length of each pipe.
- F. Holes for the bells shall be excavated so that after placement the pipe and coupling receive uniform bearing pressure from the trench bottom.

- G. Each pipe shall be laid to the line and grade and in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.
- H. As the work progresses, the interior and exterior of the pipes and couplings shall be cleaned of all dirt and superfluous material of every description.
- I. When required to keep interior of pipe clean, a suitable drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed.
- J. At times when work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipe or fitting.
- K. Any pipe that has been disturbed after lying shall be taken up and re-laid.
- L. All materials found to be defective during the progress of the work will be rejected by the Owner Representative and the Contractor shall promptly remove such defective material from the site of the work and replace with new material at no additional expense to the Owner.
- M. The Contractor shall be responsible for the safe storage and proper handling of all materials.
- N. No shims or mounds of earth shall be used to raise the pipe to grade.
- O. All pipe shall be maintained accurately to the required line and grade.
- P. No pipe shall be covered until the Owner Representative has inspected the joints.
- Q. The pipeline shall not be used to convey trench drainage during construction.
- R. Pipes shall be protected at all times during construction against flotation. They shall be thoroughly secured, properly supported and bedded to prevent settlement or disturbance. Compaction of bedding and backfill material shall be in strict accordance with Section 02200, EARTHWORK.
- S. Bends, crosses, tees, caps, plugs, valves, and other appurtenances, shall be strapped and clamped where indicated and/or as directed. Steel bars, rods and plates shall be of structural steel. Straps, bridle rods, clamps, anchors and such other parts shall be provided to the details as directed and as approved. After installation, all parts of the strapping and clamping devices shall be given two (2) heavy coats of an approved coal-tar base protective coating.

JOINTING.

- A. No pipes shall be jointed until couplings and ends of pipe have been inspected to determine that the joint surfaces are free from any defects in materials or workmanship, and free from dirt or other foreign matter.
- B. Pipe, pipe fittings and accessories shall be stored, installed, joined and protected by the

Contractor in strict accordance with the printed recommendations of the manufacturer of the piping material, and as approved.

- C. Field assembled joints shall be checked with a suitable gauge as recommended by the manufacturer to ensure that the rubber rings are properly located.
- D. If inspection indicates that the rings are improperly located, the Contractor shall disassemble, and properly reinstall the pipe.
- E. Pipe stoppers shall be installed, sealed and blocked in such a manner as to prevent any leakage and so as to withstand an internal hydrostatic pressure of not less than 5 psi.
 - 1. Timber blocking shall be of adequate size and arrangement to prevent the stopper from being blown off the line.
 - 2. Timber bracing shall extend back to the undisturbed end of the trench.

PIPE DEFLECTION ALLOWANCES (FULL LENGTH PIPE)

Maximum permissible deflection, in.*

Size of Pipe	Maximum Joint Deflection in Degrees	Tyton Joint	Approx. Radius in Ft. of Curve Produced by Succession of Joints.
4"	5 ⁰	19	205
6"	5 ⁰	19	205
8"	5 ⁰	19	205
10"	5 ⁰	19	205
12"	5 ⁰	19	205
14"	4 ⁰	15	260
16"	4 ⁰	15	260
20"	3 ⁰	11	345
24"	3 ⁰	11	345

*Maximum permissible deflection for 18' length; maximum permissible deflections for other lengths shall be in proportion of such lengths to 18'.

TEMPORARY PLUGS

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed. Pipelines shall not be used as conduits for trench drainage during construction.

VALVES AND APPURTENANCES

PART 1 - GENERAL

SUMMARY.

- A. The work under this Section includes the furnishing, installation and testing of all valves, tapping sleeves, and appurtenances as indicated on the plans or as may be required by the Owner.

QUALITY ASSURANCE.

- A. Manufacturer's Recommendations:

The Contractor shall submit for approval six (6) copies of the manufacturer's printed recommendations for the storage, protection, handling and installation of the valves, tapping sleeves and appurtenances, which shall be strictly adhered to by the Contractor.

- B. Certificate of Compliance:

Each shipment of valves, tapping sleeves and appurtenances shall be accompanied with the manufacturer's notarized certificate certifying conformance with the requirements of the Specifications.

MARKING.

Marking of all tapping sleeves shall conform to the requirements of AWWA 110 latest revision, marking of all valves shall conform to the requirements of AWWA 509 latest revision, and marking of all shall conform to the requirements of AWWA 502, latest revision.

MANUFACTURER'S REPRESENTATIVE.

- A. The Contractor shall furnish at no additional expense to the Owner, the services of the manufacturer's representative for instruction of the contractor personnel who will be installing the tapping sleeves and valves. The instruction shall include proper handling, installation and jointing, and other construction areas and shall be for such lengths of time required to fully familiarize the Contractor's personnel with proper techniques. This information shall be bound and indexed for each type of unit as herein specified.

REFERENCES.

- A. Standard Specifications when referenced to in this Section shall mean the "Standard Specifications for Roads, Bridges, and Incidental Construction" of the Connecticut Department of Transportation, 1995 Edition.

PART 2 - PRODUCTS

TAPPING SLEEVES AND TAPPING VALVES. All material shall be made in the United States of America.

All tapping sleeves shall comply in all respects to AWWA Standard C-110 and the following design standards:

1. Tapping sleeve shall be installed at the location of the existing water main as shown on the plans and details.
2. The tapping sleeve shall be a mechanical type joint to provide pressure - tight installation and be suitable for use with the existing pressurized pipe material. Tapping sleeves shall be manufactured by Mueller, Model H-615. Outlet flange shall be Class 125C, ANSI B16.1.
3. Mechanical joint tapping sleeves shall have totally confined end gaskets and be designed to withstand a minimum of 200 p.s.i. working pressure.
4. Tapping valves shall comply with Section 2-3 - Gate Valves except one end shall be flanged and the other mechanical.
5. Tapping Valves shall be manufactured by Mueller, Model T2360, and shall be resilient wedge type, open left for mechanical joints.
6. Tapping valves shall be provided with an oversized opening to allow the use of full size cutters.

BURIED GATE VALVES.

- A. Resilient seated gate valves shall meet AWWA C-509 and be UL listed and FM approved. This valve shall be iron-body, bronze mounted, non-rising stem, 4 inch through 12 inch in diameter as shown on plans. All valves to open left. All valves to be mechanical joint.
- B. Sizes 4 inch through 12 inch shall be suitable for 200-psig maximum working pressure and 400-psig-test pressure. Size 16 inch shall be suitable for 200-psig maximum working pressure.
- C. Valve shall have a minimum of two O-ring stem seals.
- D. Bonnet and gland bolts and nuts shall be stainless steel for corrosion resistance.
- E. The interior and exterior of valves shall be fully epoxy coated 8 mils thick.
- F. Gate valves shall be as manufactured by Mueller, Model A2360 or approved equal.

BUTTERFLY VALVES

- A. Buried butterfly valves shall be iron-body, ductile iron valve discs with rubber seats offset from the valves shaft in order to provide complete 360⁰ seating having mechanical, flanged or bell-and-spigot ends necessary to match connecting pipe. The valves shall be suitable for 150 psi working pressure for 12" to 24" sizes and shall conform to the AWWA Standard for Rubber-Seated Butterfly Valves, Designations C504-94 insofar as applicable. Valves shall be made by the Mueller Company, Decatur, Illinois or approved equal.
- B. They shall, in addition, meet the following requirements:
- C. Valve body seating surface shall be Stainless Steel, ASTM A276, Type 304. The mating seat shall be natural rubber bonded to an 18-8 stainless steel seat retaining ring and shall be mounted on the disc. The rubber seat mounted on the disc shall be field adjustable and field replaceable.
- D. Valve shafts shall be Stainless Steel, ASTM A276, Type 304 of the stub shaft design. The shafts and disc shall be connected by means of an O-ring sealed taper pin, held in place by self-locking nuts. The disc shall be held in the center of the valve by factory set thrust collars. Shaft seals shall be of the O-ring type in removable bronze cartridge.
- E. Operators shall be of the traveling-nut type with readily adjustable end stops without disassembly of operator or use of machine tools. Operators shall be field replaceable.
- F. All valves furnished shall open left.

ABOVE GROUND BLOW-OFF VALVE.

- A. Blow-Off valves shall be non-freezing, self-draining type.

- B. Blow-Off valves shall be furnished with a 4" MJ inlet, a non-turning operating rod, and shall open to the left.
- C. All of the working parts shall be of bronze-to-bronze design, and be serviceable from above ground with no digging.
- D. Units shall operate with a standard 2" gate valve wrench.
- E. When open, valve shall be 100% unobstructed and drain hole shall be covered.
- F. The outlet shall be 4" FIP with plug and extend a minimum of 12" above the ground.
- G. The Blow-Off valve shall be a Model # 7500 manufactured by Kupferle Foundry Co., St Louis, MO, or an approved equal.

STRAIGHT AND TRANSITION PIPE COUPLINGS.

- A. The center sleeve and end rings of couplings shall be made of ductile iron, meeting or exceeding ASTM A536. The coupling shall accommodate the entire O.D. range in the specified size by use of interchangeable color-coded end rings and gaskets.
- B. The coupling shall be made of virgin rubber compound for water use. The SBR shall meet or exceed ASTM D2000-3-BA715. The gasket shall have raised lettering and sizing and state the proper color code for the appropriate end ring.
- C. The coupling shall be equipped with stainless steel bolts, washers, and nuts, and conform to the latest edition of AWWA C111.
- D. Straight couplings shall be as manufactured by Ford Model FC1-SH, Smith Blair Model 441, Romac Model 501, Cascade Waterworks Model CDC, or approved equal.
- E. Transition/Repair couplings shall be as manufactured by Smith Blair Model 441, or approved equal.
- F. Repair Clamp shall be as manufactured by Smith Blair Model 226 or 227 or approved equal.
- G. Straight connections between two ductile iron pipe sections shall be made by ductile iron solid sleeves.

VALVE BOXES AND COVERS.

- A. Cast iron valve boxes shall be two-piece adjustable style, slip type, as manufactured by Tyler, Bibby, or equal. Barrel inside diameter shall be 4½ inches with 26-inch top section and 48 inch bottom section lengths adjusted to finish grade.
- B. Covers shall be cast iron, 5¼ inch, with the word "WATER" and a direction to open arrow imprinted thereon. The boxes and covers shall be compatible with the valves to which they attach.
- C. An approved operating key shall be provided to the Owner.

JOINT RESTRAINT.

- A. Restraining devices shall be used where indicated, directed or as required. Joint restraint shall be concrete thrust block and mechanical joint restraint. Mechanical joint restraint shall be manufactured by EBAA Iron, of type Mega-Lug pattern, Model 1100 for mechanical joints.
 - 1. Restraining devices shall be utilized on all mains under the following conditions:
 - 2. Pipeline direction changes (tees, bends)
 - 3. Dead end lines (caps, plugs, valves)
 - 4. Transition pieces (reducers)
- B. Thrust restraint shall be provided via restrained joint, ductile iron pipe meeting AWWA C151/A21.512 and AWWA C111/A21.11. Restrained joint pipe lengths (restrained length) shall be sufficient to restrain thrust imparted by 1½ times the anticipated working pressure but not less than 200 psi.
- C. Thrust restraint utilizing tie-rods shall be utilized on vertical bends from MJ Bend to MJ Bend or as directed by the Owner or specifically indicated. Tie-rod diameters shall be 2 times the diameter required to restrain the main. All rods shall be protected from corrosion with two coats of bituminous paint or epoxy.

INDICATOR POST.

- A. Indicator post and valve shall be Underwriter's Laboratories, Inc. (UL) listed and Factory Mutual Research (FM) approved.
- B. Indicator post shall be equipped with an angle-type operating wrench, which shall be locked to the post thus preventing unauthorized valve operation.
- C. Indicator post and valve shall be the two-piece type manufactured by US Pipe or approved equal.
- D. Indicator posts shall be supplied on all buried gate valves for full operation of opening and closing of valves.

- E. Targets shall be set in the indicator posts to indicate “open” and “shut” position and shall be in full view.
- F. Provide stem and coupling of adequate length for valve operation, along with adjustable setting box and base with a flange having sufficient bearing area to prevent under settlement. The lower base shall be designed to enclose the operating nut and stuffing box of the valve and fit over the valve bonnet.

FIRE HYDRANTS.

- A. All fire hydrants shall comply in all respects to AWWA C-502 and the following design standards:
 - 1. Fire hydrants shall be of the compression type, closing with the line pressure.
 - 2. The depths of bury shall be 5 feet minimum to top flange of hydrant boot. Hydrant extensions, which may be required, shall be manufactured by the same manufacturer of the hydrants being installed.
 - 3. Hydrant shall be furnished with a sealed reservoir located in the bonnet so that all threaded and bearing surfaces are lubricated each time the hydrant is operated.
 - 4. Hydrant shall be equipped with "O" ring packing. Each nozzle cap shall be provided with a Buna-N rubble washer.
 - 5. A bronze or rustproof steel nut and check nut shall be provided to hold the main hydrant valve on its stem.
 - 6. Hydrant shall be equipped with two 2-½ inch hose nozzles, and one 4-½ inch steamer nozzle; three way, National Standard Threads with 1-½ inch pentagonal nuts.
 - 7. Each hydrant shall be able to deliver 500 gallons per minute through its two 2-½ inch hose nozzles when opened together with a loss of not more than 2 psi through hydrant.
 - 8. Hydrant shall have at least two (2) bronze or copper lined drain outlets. The shoe of the hydrant shall be 6 inch mechanical joint D-150, suitable for use either with centrifugally cast pipe or Class D Pit Cast Pipe. Lugs will be case on either side shoe, securely anchoring the hydrant. Hydrants shall be furnished with a breakable feature that will break cleanly upon impact. This shall consist of a 2-part breakable safety flange with a breakable stem coupling. Hydrant nozzles must be able to be rotated to any position without disassembly of ground-line flange.
 - 9. Hydrants shall open to the LEFT and shall have a direction-to open arrow with the work "OPEN" imprinted on the hydrant.
 - 10. Hydrants shall be post type.
 - 11. Hydrants shall be so arranged that the direction of outlets may be turned 90 degrees

without interference with the drip mechanism or obstructing the discharge from any outlet.

12. Hydrants shall be furnished with caps, double galvanized steel hose cap chain, galvanized steel pumper hose cap chain, a galvanized steel chain holder and any other hooks and/or appurtenances required for proper use.
13. All hydrants shall be equipped with a 6" gate valve in accordance with Section 2-3 above, and be fully restrained as shown on the drawings. Restrained joints shall be by Megalug Thrust Restraint Wedge manufactured and sold by EBAA Iron Sales Inc.
14. Hydrants shall be Mueller No. A423 5-1/4" valve opening Centorion 250 which opens left.
15. Hydrant shall be sand blasted to SSPC/SP-6, primed with phenolic urethane compatible coating 5 mils thick, and finish coated red The boot coating shall be fuse-bonded epoxy or thermal set epoxy for interior and exterior - holiday free with minimum 8 mils thickness meeting or exceeding AWWA C550.
16. For every 4 hydrants installed the following shall be provided to the Owner (If less than 4 hydrants are installed, at least one completed set of the following shall be provided):
 1. One (1)-traffic repair kit,
 2. One (1) full set of "O" - rings and gaskets,
 3. One (1) set of drain valve facings,
 4. One (1) hydrant valve removal wrench, and
 5. One (1) hydrant-operating wrench.

All parts shall be properly labeled and housed in a carton with part numbers clearly indicated.

PART 3 - EXECUTION

3.01 INSTALLATION.

A. General:

1. All tapping sleeves, valves and accessories shall be carefully inspected by the contractor for defects before installation and all defective, unsound or damaged materials shall be rejected.
2. The Owner's Representative will make such additional inspections as he deems necessary and the Contractor shall furnish all necessary assistance for such inspection.

3. Proper implements, tools and facilities satisfactory to the Owner's Representative shall be provided by the Contractor for the proper and satisfactory execution of the work.
- B. Tapping sleeves, valves and appurtenances shall be new and unused and shall be of the types and materials specified as indicated or as directed.
- C. The interior of tapping sleeves and valves shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operation.
- D. Tapping sleeves and valves shall be constructed in dry trenches and shall not be laid when the conditions of the trench or the weather is unsuitable for such work.
- E. Tapping sleeves, valves and couplings shall be laid to the line and grade in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.
- F. At times when work is not in progress, open ends of tapping sleeves and valves shall be securely closed so that no trench water, earth or other substances will enter.
- G. Any tapping sleeves or valves that have been disturbed after laying shall be taken up and relayed.
- H. All materials found to be defective during the progress of the work will be rejected by the Owner's Representative and the Contractor shall promptly remove such defective material from the site of the work and replace with new material at no additional expense to the Owner.
- I. The Contractor shall be responsible for the safe storage and proper handling of all materials.
- J. No shims or mounds of earth shall be used to raise the equipment to grade.
- K. No tapping sleeve, valve or appurtenance shall be covered until the joints have been inspected.
- L. Installed materials shall be protected at all times during construction against flotation; they shall be thoroughly secured, properly supported and bedded to prevent settlement or disturbance.
- M. Tapping sleeves shall be installed where indicated or as directed by the Owner's Representative and shall be installed according to the manufacturer's recommended procedures.
- N. Valves and joint restraints shall be installed where indicated or as directed by the Owner's Representative and shall be installed according to the manufacturer's recommended procedures.

SETTING VALVES AND VALVE BOXES.

- A. Valves shall be set in the pipelines as directed. Blocking or supports of a permanent nature shall be placed under each valve to ensure against settlement.
- B. Each valve shall be tightly closed before being placed in the line and shall remain so until the joints on each side are completely tightened.
- C. Valve boxes shall be set for all valves. They shall be carefully fitted together and to the valve and securely held during backfilling. They shall be centered over the valve-operating nut. The bedding material around them shall be thoroughly tamped in placed and the box cover set to the finished grade.

TESTING.

- A. All materials shall be tested for tightness as soon after installation as possible in accordance with Section 02675.
- B. All materials found to be defective during testing shall be replaced with new and approved material at no additional expense to the Owner.

TEST REPORTS AND CERTIFICATES.

- A. In addition to other requirements specified herein, the Contractor shall furnish to the Owner Representative notarized test reports and methods of test by an approved independent testing laboratory to show compliance of all materials furnished under this section of the Specifications with all the requirements herein.
- B. Each shipment of tapping sleeves, valves, shall be accompanied by the manufacturer's notarized certificate of conformance certifying that materials to be furnished under these items meet all requirements herein.
- C. All testing of materials furnished under this section of the Specifications shall be provided by the Contractor at no additional expense to the Owner.

CORPORATION STOPS AND FITTINGS.

Corporation Stops:

1. The inlet thread shall be AWWA taper "cc" threads and conform to AWWA 800 latest revision. The outlet thread shall conform to CTS and accessories required for a compression type connection suitable for use with polyethylene service tubing as specified herein. Design to withstand a minimum of 200-psi pressure.
2. Corporation stops shall be Mueller Style No. H-15008. For the purposes of system standardization, no substitution will be allowed.

Fittings - Brass:

1. Compression Fitting: Materials shall meet standard AWWA C-800 for brass fittings. The fittings and adapters shall be furnished with CTS Type for connections to polyethylene service tubing. Fitting design to withstand a minimum of 200-psi pressure and shall be as manufactured by Mueller. For the purposes of system standardization, no substitution will be allowed. The fittings shall Mueller H-15403

CURB STOPS.

Curb stops to meet the following requirements:

1. Valve to open left.
2. T-head which aligns with the port that provides a quick identification of valve position.
3. Valves shall be of bronze, meeting AWWA C-800.
4. Design of valve shall be for a minimum hydrostatic test pressure of 200-psi pressure.
5. Connections shall be CTS Type connections couplings for suitable use with polyethylene service pipe (tubing) material being installed and existing polyethylene tubing services.
6. Curb stop shall be non-draining type.
7. Curb stops shall be Mueller ball type B25209. For the purposes of system standardization, no substitution will be allowed.

CURB BOXES.

- A. Curb boxes shall be 2½-inch 94E Buffalo box slide type, and manufactured by Tyler, Bibby, or approved equivalent. The construction shall provide adjustment for varying grade levels and provide allowance for settlement or frost heave. Extension range shall be 40” to 60”. The boxes shall completely cover the curb stop. "Water" shall be clearly cast on the cover and have a brass pentagonal bolt.
- B. The box and cover shall be coated inside and out with a tar base enamel.

WATER SERVICE PIPING (TUBING).

A. EndoPure POLYETHYLENE TUBING

1. Water service piping shall be EndoPure Polyethylene as manufactured by Endot Industries, Inc. or approved equal. EndoPure Polyethylene tubing shall be copper tube size (CTS) and have a working pressure of 200 psi.

2. EndoPure Polyethylene shall meet the applicable standards of ASTM D1248, ASTM D3350, ASTM D2239, and NSF-14 and shall meet the minimum values in the following table:

PHYSICAL PROPERTY REQUIREMENTS EndoPure Polyethylene		
Property	Test Method	Requirement
Cell Classification	ASTM D3350	345444A
Density	ASTM D1505	0.944 g/cc
Melt Index	ASTM D1238	>15.0 g/10 min
Tensile Strength	ASTM D638	>3,300 psi
Elongation	ASTM D638	>800%
Hydrostatic Design Basis	ASTM D2837	1,600 psi @23°C
Flexural Modulus	ASTM D790	12,000 psi
Brittleness Temperature	ASTM D746	< -180 °F
Environmental Stress Crack Resistance	ASTM D1693	>5,000 hours

INSTALLATION OF WATER SERVICE LINES.

- A. Water service lines or branches shall be installed in accordance with the detail attached to this specification.
- B. For service branch installations, it is anticipated that the Contractor will use the conventional open-trench method, or he may choose any method of installing the water service piping, as approved by the Owner's Representative.
- C. Corporation stops shall be directly tapped into the water main and the polyethylene service piping (tubing) of the size specified shall run from the corporation stop to the curb stop.
- D. Corporation stops shall be installed as near the horizontal diameter as possible. The length of travel of the tap should be so established that when the stop is inserted and tightened with a 14-inch wrench, not more than one to three threads will be exposed on the outside. When a wet tapping machine is used, the corporation cock shall be inserted with the machine while it is still in place. Stops shall be tightened only sufficiently to give watertightness and care must be constantly exercised not to overtighten them.
- E. The Contractor shall install straight couplings to existing water mains of the sizes required in the locations designated by the Owner's Representative in the field. The Contractor shall utilize the manufacturer's recommended installation procedures while performing the work. Care shall be taken to ensure a watertight connection.
- F. Curb stops will, in most cases, be installed to beyond the roadway alignment and beyond the sidewalk on sides of the road that have a sidewalk, as shown on the drawing details.

The Contractor shall install the curb stops and boxes in a workmanlike manner as described herein and as directed by the Owner's Representative and shall place clean compacted sand around and below the curb stop.

- G. Curb stops shall be furnished with a tailpiece, and end plug, which will be removed during future connection to the service stop.

- H. The boxes shall be set in a true vertical position and if they are within the limits of the roadway or within limits where the plowing of snow will take place in the winter, the tops of the boxes shall be set about 1/2 inch below the top of the finished grade. In locations where these boxes are not likely to be disturbed, the tops shall be set flush with the adjoining ground.

- I. Care shall be exercised in the placing and laying of polyethylene service tubing to be sure that the pipe (tubing) does not have kinks or sharp bends and to assure against it being in contact with sharp stones or ledge which would cause damage to the pipe. At least 12-inches of clean compacted sand shall be placed adjacent to, below and above the water service tubing and no stone shall be placed over the pipe until the depth of backfill above the latter is in excess of 1-ft.

- J. All new water services shall have a minimum cover of four and one-half feet, as measured from finished grade; throughout the installation from the water main to the curb stop.

BACKFLOW PROTECTION

MPTN UTILITIES PRODUCT STANDARD

Reduced Pressure Backflow Preventors (RPZ) shall be installed at all water service entry points to Tribal Government, Commercial, and Enterprise facilities. MPTN Utilities product standard is Watts RPZ model 909.

INSTALLATION REQUIREMENTS

The installation for the potable water service shall consist of a primary and a secondary backflow device with isolation valves for each of the devices. The backflow devices shall be tested by certified backflow Testor utilizing test equipment with a current test certification prior to activation of the water service. The fire suppression service shall utilize a double check valve assembly for fire services that do not utilize chemical additives. The model of the backflow prevention device shall be subject to the approval of MPTN Fire Dept. and Factory Mutual. If chemicals are utilized in the fire suppression system a RPZ backflow device shall be installed.

RPZ Backflow Prevention Devices shall be also installed at the water service entrance points of vendor outlets and restaurants that utilize water for public use and consumption to include but not limited to food service, bars and nightclubs. All other backflow devices shall be required and installed as per the current adopted International Plumbing Code. All point of water service entry backflow devices shall be installed in a well-lit area no more than 6 feet from ground level and easily accessible without need of a ladder or confined space entry. See schematic drawing detail on Page 44 for typical installation.

WATER METERS

MPTN UTILITIES PRODUCT STANDARD

MPTN Utilities product standard is Hersey. Meters shall be equipped with a translator pulse capability, measure in cubic feet, and capable of measuring water flow (+) or (–) 1% accuracy during high flow and low flow conditions. The design engineer and contractor shall submit the product data of the proposed meter along with high and low flow conditions for review and approval by the Utilities Department.

INSTALLATION REQUIREMENTS

1. All Commercial, Tribal Government, and Enterprise meter installations shall include bypass piping and isolation valves to allow meter removal without interruption to the water service. Meters installed inside the customer's building shall be located as near as possible to the point where the service pipe enters the building and at a point reasonably secure from injury and readily accessible for reading and testing.

Meters shall be installed in a easily accessible area no higher than 5 feet above floor level and located as near as possible to the water service entrance. If the meter is installed in a locked closet a remote reader shall be installed so the meter can be easily read outside of the closet or in an accessible hallway. Under no conditions shall a meter be installed in the overhead ceiling. Installation of a meter in a meter pit outside of the building will not be allowable with prior approval from the MPTN Utilities Dept. See schematic drawing detail on Page 44 for typical installation.

PRESSURE AND LEAKAGE TESTS

The pipelines shall be given combined pressure and leakage tests in sections of approved length in accordance with the AWWA Standard Specification (C600-93). The pressure test shall be conducted at 200 PSI for a period of 2 hours and shall be performed by a certified third party testing laboratory, the contractor shall be responsible for all costs of third party to perform pressure testing, chlorination, flushing, and bacterial sampling.

The scheduling of pressure and leakage test shall be as directed by the MPTN Utilities Department.

Subject to approval, and provided that the tests are made within a reasonable time considering the progress of the project as a whole and the need to put the section into service, the Contractor may make the tests when he desires.

The Contractor shall furnish and install suitable temporary testing plugs or caps for the pipeline; all necessary pumps, pipe connections and other similar equipment; and all labor required, all without additional compensation. The contractor shall furnish a water meter and a pressure gauge which the Contractor shall install in such a manner that all water entering the section under test will be measured and the pressure in the section indicated.

Pipelines in excavation or encased in the concrete shall be tested prior to the backfilling of the excavation or placing of the concrete.

Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants or blow-offs are not available at high points for releasing air, the Contractor shall provide all blow offs necessary, make the necessary excavations and do the necessary backfilling and make the necessary taps at such points and shall plug said holes after completion of the test.

The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.

The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gauge location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period exceeds a rate of 10 gallons per inch of diameter per 24 hours per mile of pipeline, the section shall be considered as having failed the test. All joints within chambers and all flanged joints shall have no visible leakage. No caulking of compound joints with lead or other foreign material will be allowed. Compound joints which drip slightly will, in general, be satisfactory, but no joints from which water continues to run or squirt in an active manner will be accepted.

If the section shall fail to pass the pressure test or the leakage test, or both, the Contractor shall do everything necessary to locate, uncover and repair and replace the defective pipe, fitting or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified tests.

DISINFECTING AND FLUSHING

After a section of the main has been tested and found acceptable, it shall be flushed thoroughly by MPTN Utilities and the Contractor. Upon completion of flushing operations, the approved 3rd Party testing agency hired by the Contractor shall disinfect the main with a solution consisting of 50 ppm of chlorine (which shall be retained in the main for at least 24 hours) in accordance with the AWWA Standard Specifications for Disinfecting Water Mains C651-92, Sections 1 to 9, inclusive.

Before the bypass pipes and service connections are put into use, the approved 3rd Party testing agency hired by Contractor shall disinfect the piping with a solution consisting of 50 ppm of chlorine, which shall be retained in the pipe for at least 8 hours. Disinfection shall be in accordance with the above mentioned AWWA Specifications insofar as applicable.

Following disinfection, all treated water shall be de-chlorinated and thoroughly flushed from the main to a drainage area approved by the Office of Natural Resources.

For all work involved, the Contractor shall furnish all equipment, material, and labor required for the testing, flushing, and chlorination. The Contractor shall also furnish means for disposal of the water used in disinfecting and flushing the main. The water shall be wasted in such a manner as to eliminate possibility of damage to roadways, adjacent property and contamination of water supply.

After disinfection and flushing but prior to placing the water main in active service a water sample representative of the new construction shall be collected in accordance with the most current version of AWWA Standard C651 by a certified testing laboratory . Samples shall be analyzed, at a minimum, for total coliform bacteria, total and free chlorine residual, and physical parameters. Test results, with the exception of chlorine, shall meet the water quality standards shown I Table 1 prior to placing the water main into service.

TABLE 1 Water Quality Standards

Parameter	Standard
Total coliform Bacteria	0 or absent (must use membrane filter (MF) technique unless HPC testing is conducted in which case the presence -absence technique may be substituted for the MF technique
Color	< 15 CU
Turbidity	< 5 NTU
Odor	< 2
pH	RANGE 6.4 - 10

As-Built Plan Requirements

The Mashantucket Pequot Tribal Nation's Planning Department has provided this document as a guide for documenting as-built information. This list is only a guide and is not all inclusive of the data to be included in as-built plans. Additional information may be required at the direction of the engineer, project manager or owner, at the contractor's expense. The contractor shall consult the MPTN Procurement Website for as-built requirements and auto-cad layering format.

1. Utilities

General Notes:

For all new utilities including drainage, as-built data shall include the size and material of the conduits/pipes and in the case of multiple conduits/pipes, the number of each. Take photographs at major utility conflicts/crossings; number pictures same as field shot numbers.

Whenever existing utilities or drainage structures, conduits or pipes are encountered, whether in use or abandoned, provide as-built information as noted below.

a. Electric / communications (to be on separate layers)

- Conduits
- Duct banks – Survey top of concrete along centerline, but drawn to actual configuration (width with depth noted). Shots to be taken every 20 linear feet or change in elevation or direction.
- Manholes – Survey center of top section for round and note diameter or for square, four corners and center of top of frame.
- Lighting and secondary electrical – Survey conduits every 20 ft and at change in elevation or direction.
- Low voltage controls and conduit – To be surveyed same as lighting with description.
- Structures – Survey center of top for round and note diameter or for square, four corners and center of top of frame. Locate all electrical equipment, (transformers, switch gears, hand holds, etc.)
- Grounding - Survey grounding system.
- Lighting – Survey all site lighting including hand holds etc.

b. Water Service

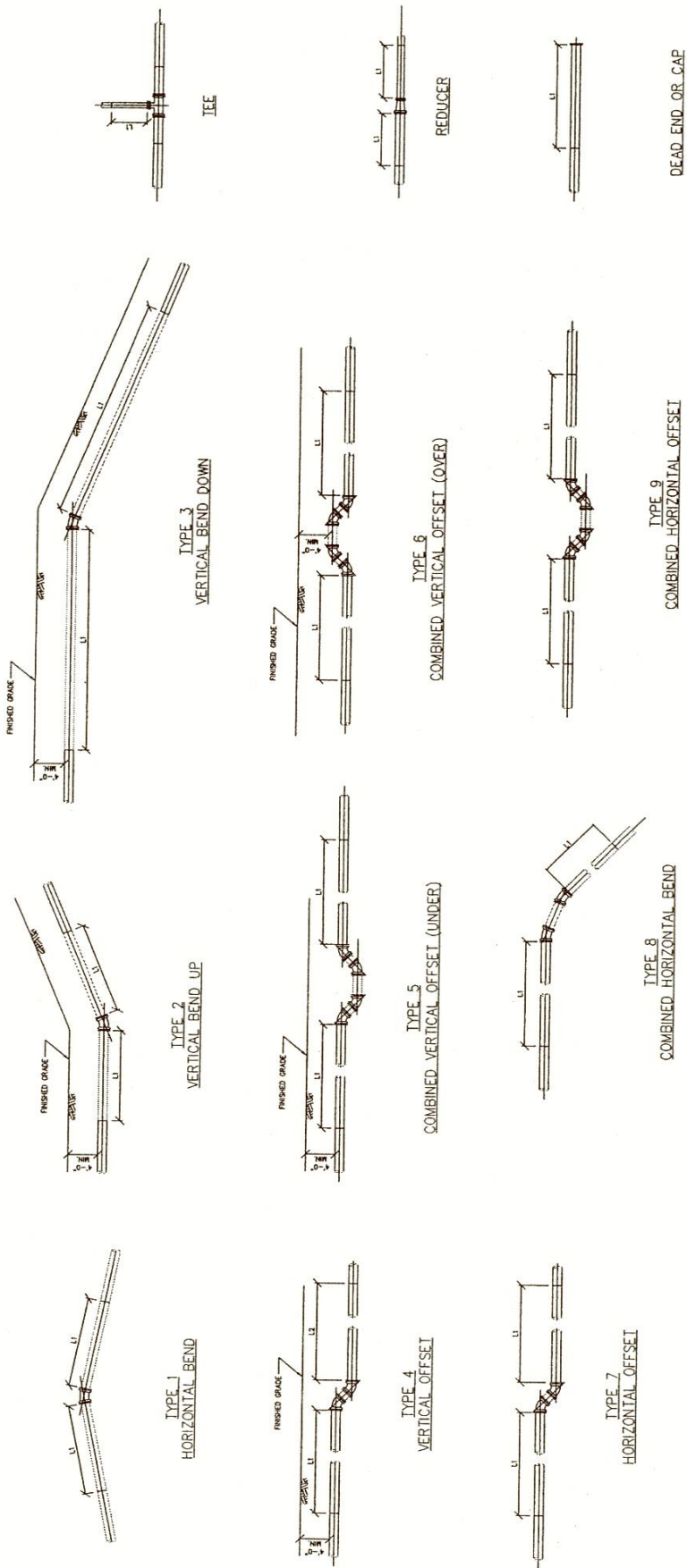
- Pipe – Shots to be taken every 20 ft. along center top of pipe, and at change in elevation or direction.

- Couplings – Survey center top of coupling; indicate bend radius.
 - Valves, Hydrants, Blow offs, Corporations – Survey center top of item and include description with size, type, material, etc.
 - Note: A separate layer will need to be created for the SWF (South Well Field) water main.
 - Thrust Blocks – Survey location and size.
 - Heat Tracing – Survey and note type and size.
- c. Sewer Line
- Sewer Manholes – Survey top of frame elevation and elevation of all inverts. Note flow direction.
 - Gravity Sewer Pipe – Survey all inverts. Identify size and type by layer per MPTN Standards. Survey shots along pipe not required if installed by pipe laser.
 - Sewer Force Mains - Survey at every change, bend or major elevation change. Survey not required at straight joints.
 - Other structures – Survey center of top section for round and note diameter or for square, four corners and center of top. Survey base of structure, inverts, access hatches, etc.
- d. Gas Service
- Gas Lines – Survey at every change, bend and weld joint. Identify size and type by layer per MPTN Standards.
 - Couplings/valves – Survey center top of coupling – indicate bend radius
 - Meters and exterior gas related equipment – Survey location and note type, etc. with text
- e. Drainage
- Catch Basins/Drainage Manholes – Survey top of frame elevation at gutter line at center of frame and elevation of all inverts. Note type (CL, C, double, etc.).
 - Pipe – Survey all inverts. Identify size and type by layer per MPTN Standards. Survey shots along pipe not required if installed with pipe laser
 - Sediment Control Structures - Survey four corners and center of top of structure. Survey base of structure, inverts, access hatch, etc. Survey plunge pools, retention ponds and provide contours.
- f. Irrigation
- Survey all sprinkler heads/ handholds and irrigation pipes.
2. Concrete
- a. Buildings and Structures – Survey footprint of footings with shots at top of corners and at every direction and elevation change. Survey corner of walls after building completion.
- b. Bridges / Retaining walls - Survey top corner of footings, top of walls, and abutments, and at elevation and direction changes. Identify geo-grid with text, hatch the area.

- c. Concrete ramps, loading docks, sidewalks, steps, patio areas, and structures – Survey at a frequency to adequately depict all items.
 - d. Snowmelt – Survey limits and hatch the area. Take photographs of area.
 - e. Columns – Survey center and extents of each column footing.
3. Planimetrics
- a. Roads – Survey elevation and of edge of road, top face of curbing, pavement markings, etc.
 - b. Landscaping – Survey planting beds, edge of tree line, etc.
 - c. Final Grading – Provide contours at 2 foot intervals. One foot interval contours will not be accepted.
4. Abandoned Utilities – Identify on drawing with text. Show cut offs.
5. Removed Utilities- Change to “Removed” layer, and note on plan as “Removed”.

STANDARD DRAWING DETAILS

MINIMUM PIPE RESTRAINTS



MINIMUM RESTRAINED LENGTH OF PIPE FOR EACH SIDE OF FITTING (FEET)
 12" DI WATER MAINS (TEST PRESSURE 200 PSI)

DIAMETER (in)	ANGLE OF BEND (DEGREES)	TYPE 1 & 2		TYPE 3	TYPE 4		TYPE 5			TYPE 6, 7, 8, & 9			TEE	
		BARE	LI		L1	L2	BARE	BARE	BARE	BARE	BARE	BARE		BARE
6" TO 12"	11.25	4	11	22	8	22	8	22	8	22	8	22	8	22
6" TO 12"	22.5	8	22	45	16	45	16	45	16	45	16	45	16	45
6" TO 12"	45	16	46	93	33	93	33	93	33	93	33	93	33	93
6" TO 12"	90	39	112	112	112	112	112	112	112	112	112	112	112	112
16x12	REDUCER	-	-	-	-	-	-	-	-	-	-	-	-	-
16x16	TEE	-	-	-	-	-	-	-	-	-	-	-	-	61
16x12	TEE	-	-	-	-	-	-	-	-	-	-	-	-	142
														110

ALL FITTINGS MECHANICALLY RESTRAINED USING MEGALUGS (EBAA SERIES 1100 OR APPROVED EQUAL); WHEN THE MINIMUM REQUIRED RESTRAINED LENGTH EXCEEDS THE LENGTH TO THE NEXT JOINT, USE RESTRAINED PUSH ON JOINT PIPE AS SPECIFIED (EBAA SERIES 1700 OR APPROVED EQUAL)

DEAD_END_OR_CAP

TYPE 9
COMBINED_HORIZONTAL_OFFSET

TYPE 8
COMBINED_HORIZONTAL_BEND

TYPE 6
COMBINED_VERTICAL_OFFSET (OVER)

TYPE 5
COMBINED_VERTICAL_OFFSET (UNDER)

TYPE 7
HORIZONTAL_OFFSET

TYPE 4
VERTICAL_OFFSET

TYPE 3
VERTICAL_BEND_DOWN

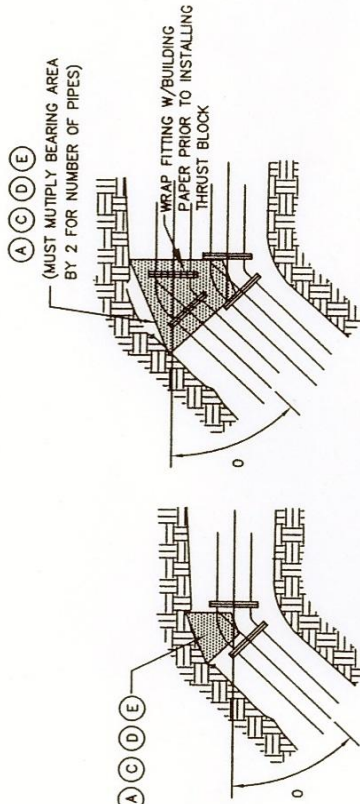
TYPE 2
VERTICAL_BEND_UP

TYPE 1
HORIZONTAL_BEND

TEE

REDUCER

SQUARE FEET OF CONCRETE THRUST BLOCKING BEARING ON UNDISTURBED MATERIAL AREAS SHOWN ARE BASED ON 100 PSI TEST PRESSURE (SEE NOTE BELOW)		PIPE SIZE										
REACTION TYPE	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
A 90° ELBOW	0.9	2.2	3.9	5.6	8.6	10.9	15.4	18.0	24.1	34.6		
B 180° TEE	0.7	1.6	2.8	4.2	6.1	8.4	10.9	13.9	17.0	24.5		
C 45° ELBOW	0.5	1.2	2.1	3.0	4.7	5.9	8.3	9.7	13.0	18.8		
D 22° ELBOW	0.3	0.6	1.1	1.5	2.4	3.0	4.3	5.0	6.6	9.6		
E 11° ELBOW	0.1	0.3	0.5	0.8	1.2	1.5	2.1	2.5	3.3	4.8		
OTHER TEST PRESSURES FOR THE ABOVE REACTIONS	SQUARE FEET OF CONCRETE THRUST BLOCKING FOR OTHER TEST PRESSURES IS DIRECTLY PROPORTIONAL TO THE ABOVE TABLE. FOR INSTANCE, AT 200 PSI TEST PRESSURE THE ABOVE NUMBERS DOUBLE. THE ABOVE NUMBERS REPRESENT MINIMUM ALLOWABLE SIZES FOR THRUST BLOCKS											

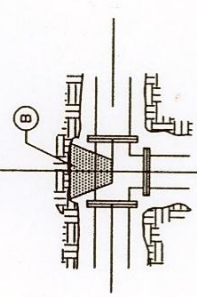
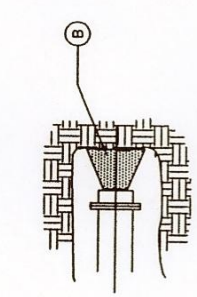


(MUST MULTIPLY BEARING AREA BY 2 FOR NUMBER OF PIPES)

53.8 77.4
38.1 54.7
29.1 41.9
14.9 21.4
7.5 10.7

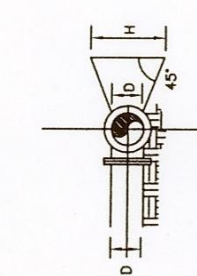
DUAL PIPE BENDS

ELBOW

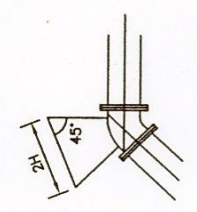


CAP

TEE



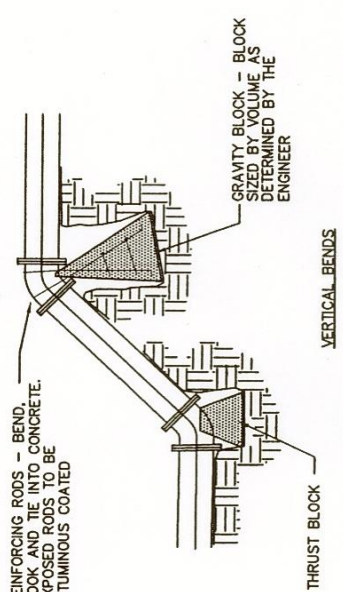
MINIMUM THRUST BLOCK DIMENSION REQUIREMENTS



* ACTUAL TEST PRESSURE IS 200 PSI AND ALL BEARING AREA NUMBERS ABOVE MUST BE MULTIPLIED BY 2

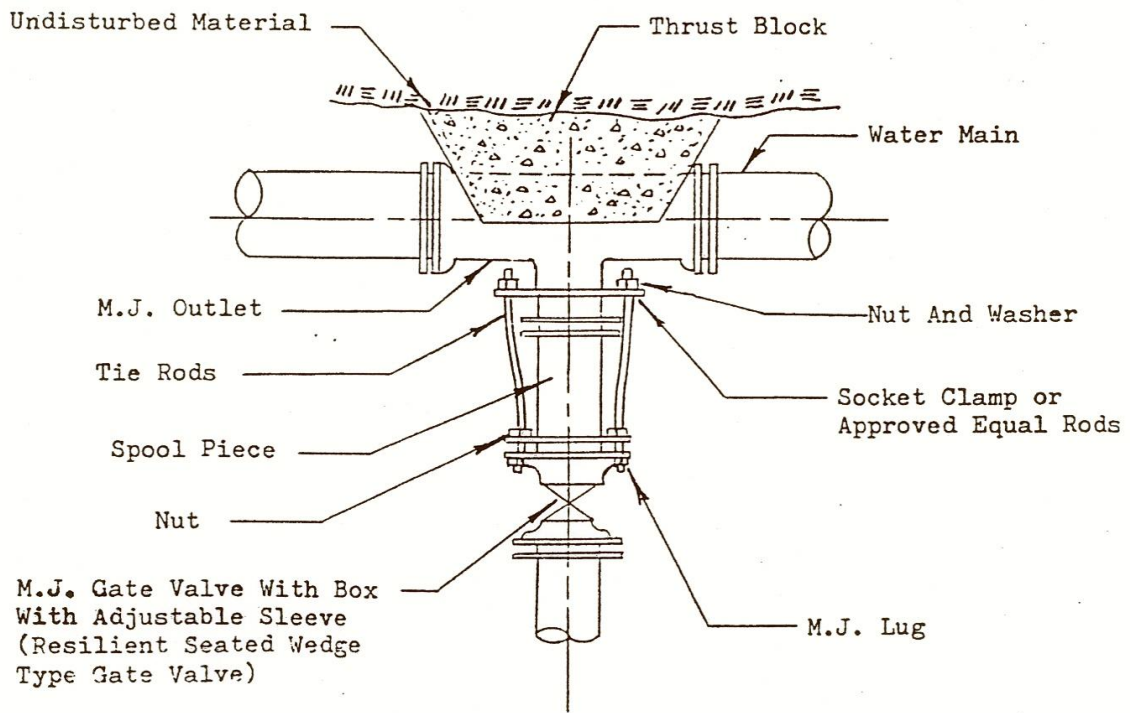
NOTES

- POUR THRUST BLOCKS AGAINST UNDISTURBED MATERIAL WHERE TRENCH WALL HAS BEEN DISTURBED, EXCAVATE LOOSE MATERIAL AND EXTEND THRUST BLOCK TO UNDISTURBED MATERIAL. NO JOINTS SHALL BE COVERED WITH CONCRETE.
- ON BENDS AND TEES, EXTEND THRUST BLOCKS FULL LENGTH OF FITTING.
- PLACE BOARD IN FRONT OF ALL CAPS BEFORE POURING THRUST BLOCK.
- REQUIREMENTS OF THE ABOVE TABLE PRESUME MINIMUM SOIL BEARING OF ONE TON PER SQUARE FOOT, AND MAY BE VARIED BY THE ENGINEER TO MEET OTHER CONDITIONS ENCOUNTERED.

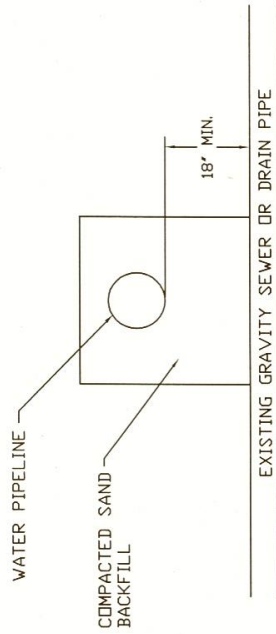


TYPICAL THRUST BLOCK DETAILS AND DIMENSIONS

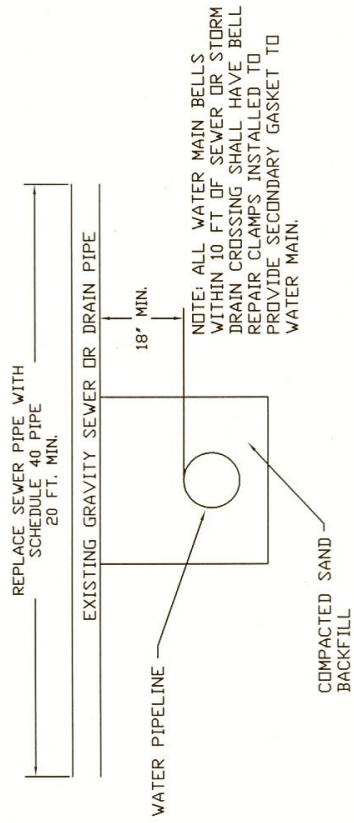
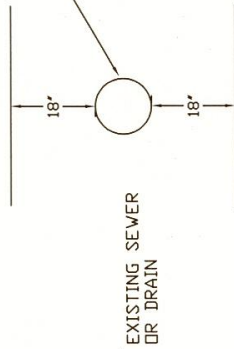
NOT TO SCALE



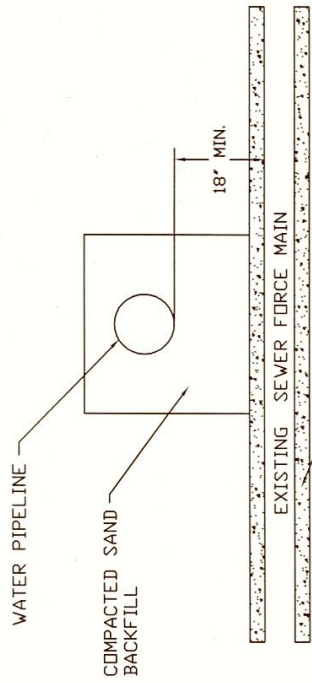
TYPICAL VALVE CONNECTION
Not To Scale



NORMAL LIMITS OF OUTSIDE SURFACE OF WATER LINE. PIPES TO BE INSTALLED WITHIN THESE LIMITS MUST CONFORM TO DETAILS SHOWN.

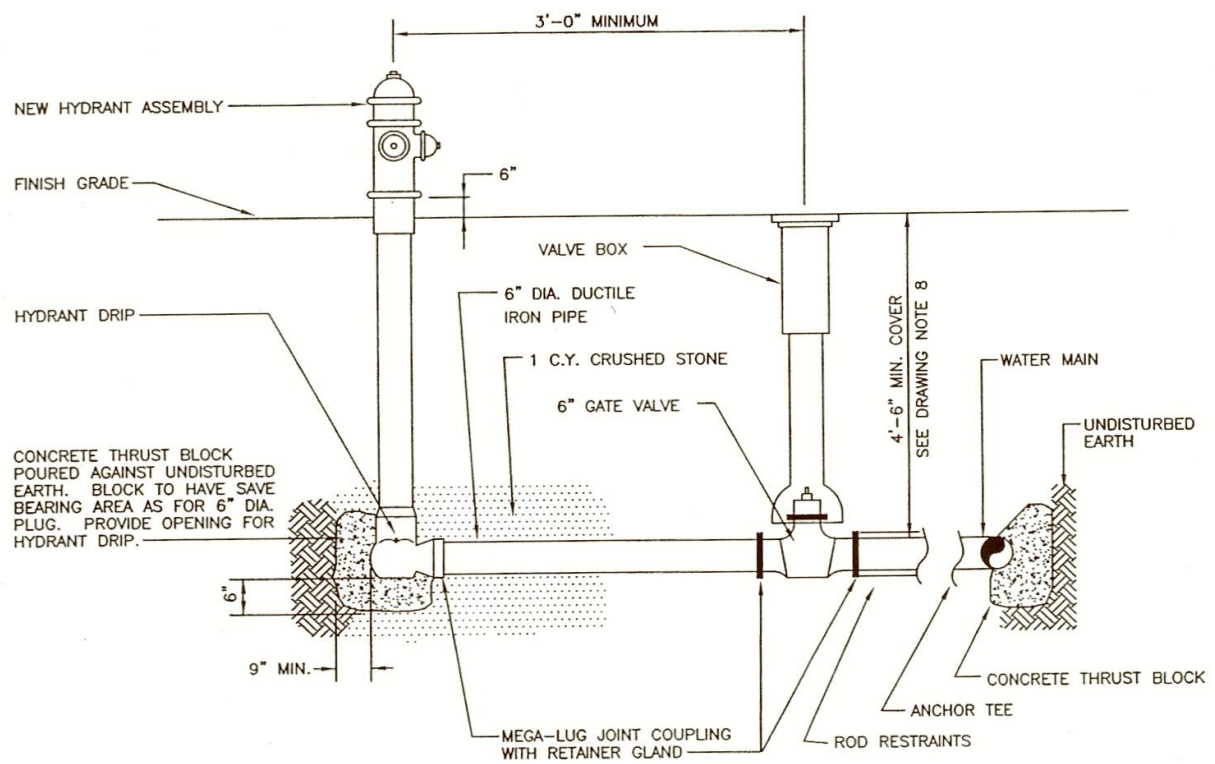


WATER MAIN CROSSING AT GRAVITY SEWER



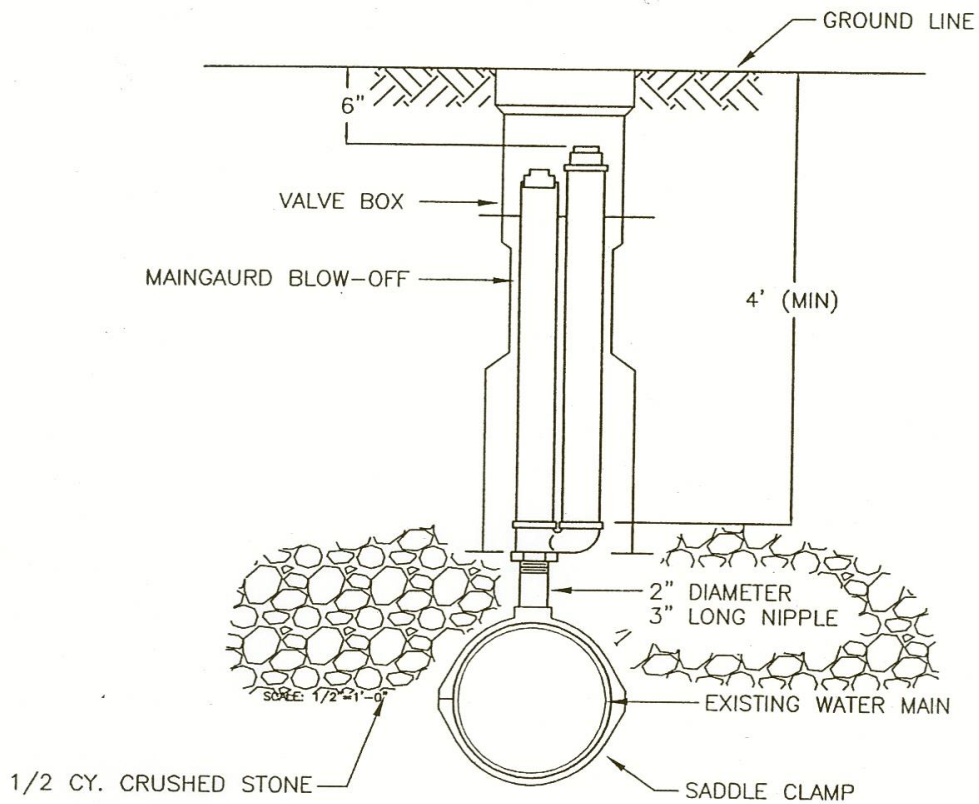
NOTE: ALL SEWER FORCE MAINS LOCATED WITHIN 10 FT. OF A WATER MAIN SHALL BE ENCASED IN 4" MIN. OF CONCRETE.

WATER MAIN CROSSING AT FORCE MAIN



TYPICAL HYDRANT INSTALLATION DETAIL

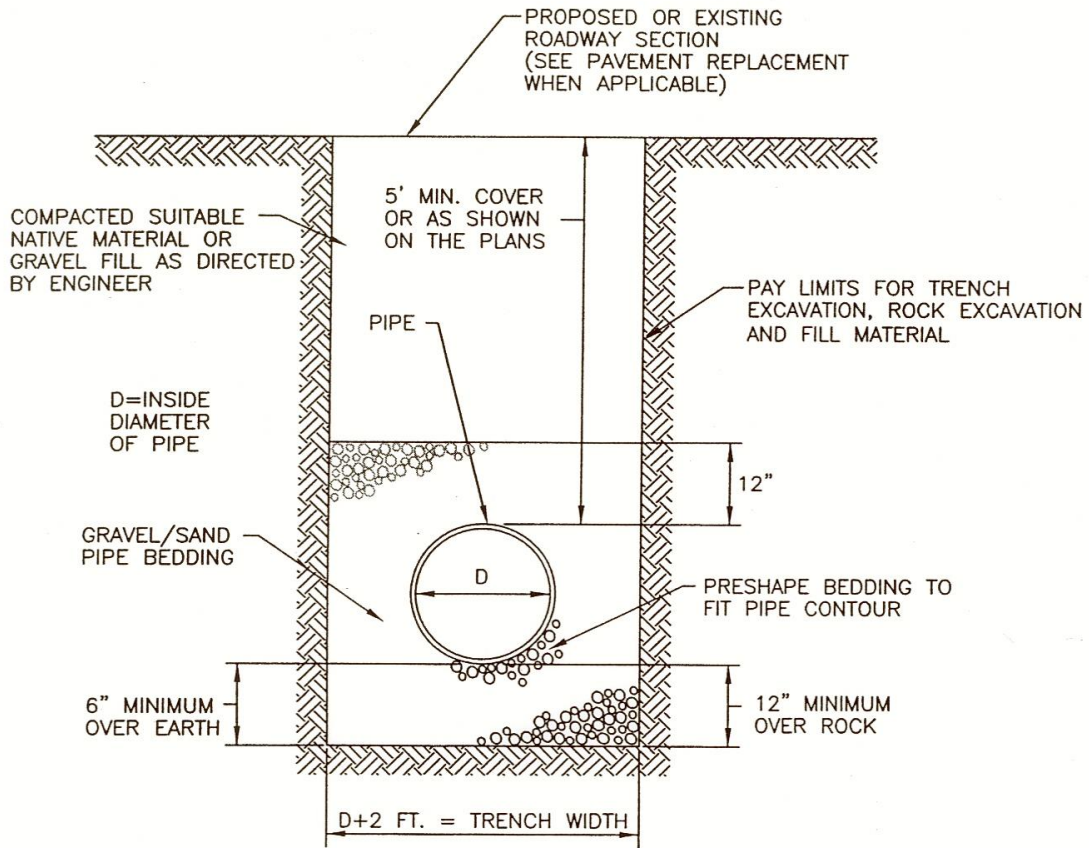
NOT TO SCALE



NOTES:

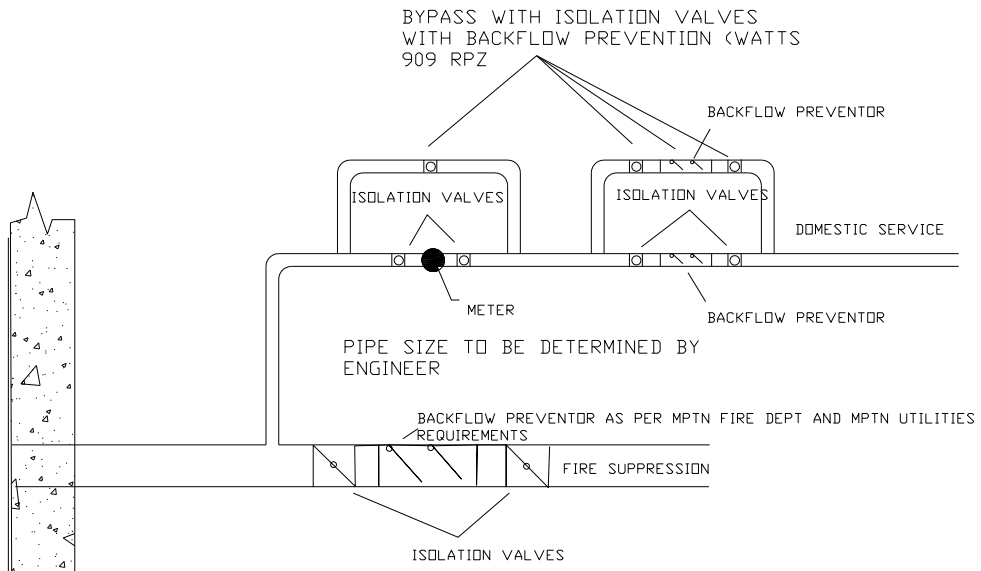
1. BLOW-OFF HYDRANTS SHALL BE NON-FREEZING, SELF DRAINING TYPE, SET UNDERGROUND IN A 5 1/4" VALVE BOX.
2. THESE HYDRANTS WILL BE FURNISHED WITH A 2" FIP INLET, A NON-TURNING OPERATING ROD, AND SHALL OPEN TO THE LEFT.
3. ALL WORKING PARTS SHALL BE OF BRONZE-TO-BRONZE DESIGN, AND BE SERVICABLE FROM ABOVE GRADE WITH NO DIGGING.
4. THE OUTLET SHALL BE A 2" FIP COUPLING WITH PLUG, AS MANUFACTURED BY KUPFERLE FOUNDRY CO., ST. LOUIS, MO, OR APPROVED EQUAL.

MANUAL AIR BLOW-OFF VALVE



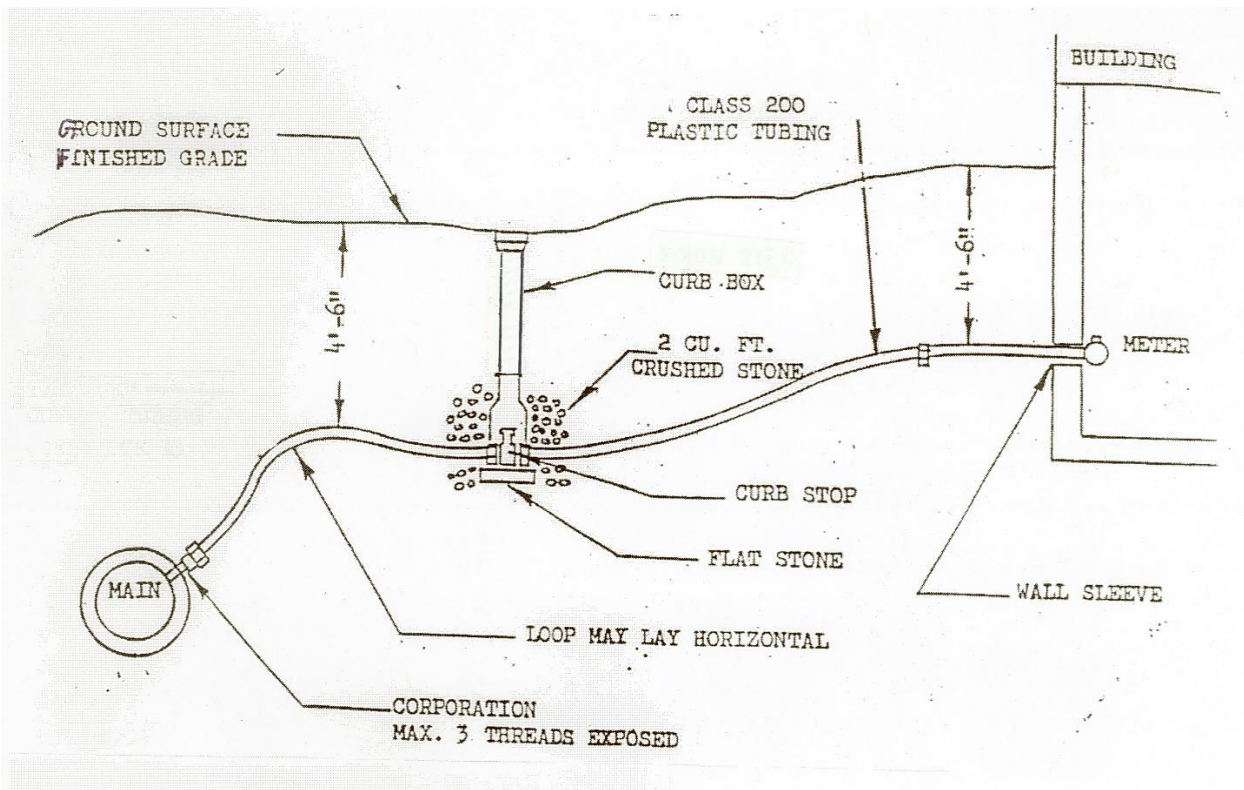
WATER MAIN TRENCH DETAIL

NOT TO SCALE



NOTE: METER SHALL BE HERSEY
TURBINE WATER METER WITH
TRANSLATOR TO ALLOW INTERFACE
WITH REMOTE READING SYSTEM AND
SUBJECT TO APPROVAL BY MPTN
UTILITIES DEPT.
BACKFLOW PREVENTION SHALL BE
WATTS 909 TYP RPZ SUBJECT TO
APPROVAL BY MPTN UTILITIES DEPT.

TYPICAL METER/BACKFLOW SCHEMATIC



WATER SERVICE DETAIL

- MINIMUM SIZE OF ANY WATER SERVICE INTALLED FROM MAIN TO PROPERTY LINE SHALL BE 1-1/2"
- SMITH BLAIR DOUBLE SADDLE TYPE SB313 SHALL BE USED FOR WATER TAPPING SLEEVE
- CTS SDR 9 HDPE Pipe CLASS 200 PLASTIC TUBING MUST BE INSTALLED FROM MAIN TO PROPERTY ASSIGNMENT LINE
- CTS SDR 9 HDPE Pipe CLASS 200 PLASTIC TUBING MUST BE INSTALLED FROM PROPERTY ASSIGNMENT LINE TO BUILDING
- GATE BOX SHALL BE TYLER UNION - 2 1/2" SLIP SERVICE BOX WITHOUT ROD AND RING WITH ENLARGED BASE TO ACCOMMODATE 1-1/2" GATE VALVE
- ALL COUPLINGS AND CORPORATIONS SHALL BE MUELLER COMPRESSION FITTINGS
- SERVICE LINES MUST BE CAULKED INSIDE FOUNDATION WALL SLEEVE
- BACKFILL: HAND—FILL WITH SAND OR EQUAL TO 6" AROUND PIPE